IN THE CLAIMS:

1. (Withdrawn) A direct oxidation fuel cell, comprising:

   (A) a membrane electrode assembly, including:

      (i) a protonically conductive, electronically non-conductive membrane electrolyte having an anode face and an opposing cathode face; and

      (ii) a catalyst coating disposed upon each of said anode face and said cathode face, whereby electricity-generating reactions occur upon introduction of an associated fuel including anodic disassociation of said fuel into carbon dioxide, protons and electrons, and a cathodic combination of protons, electrons and oxygen from an associated source of oxygen, producing water; and

   (B) an anodic metallic diffusion layer disposed generally parallel to said anode face of said membrane electrode assembly and having a plurality of openings therein to allow said associated fuel mixture to pass therethrough to said anode face of said membrane electrode assembly to a contact point on said membrane to produce said electricity generating reaction, and to allow free electrons and carbon dioxide produced in said reactions to return back away from said membrane electrode assembly, and to allow unreacted fuel to return back from said membrane electrode assembly;

   (C) a cathodic metallic diffusion layer disposed generally parallel to said cathode face of said membrane electrode assembly and having a plurality of openings therein to allow oxygen to pass therethrough to said cathode face of said membrane electrode assembly and protons, electrons and water to pass back away from said membrane electrode assembly; and

(D) a load coupled across said fuel cell providing a path for said free electrons produced in said electricity-generating reactions.

2. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said openings in at least one of said anodic metallic diffusion layer and said cathodic metallic diffusion layer comprise a plurality of pores formed in said metallic diffusion layer.

3. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein at least one of said anode metallic diffusion layer and said cathode metallic diffusion layer comprise a porous metal that has said openings therein that allow substances to pass through said openings.

4. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said anodic metallic diffusion layer is comprised of stainless steel.

5. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said cathodic metallic diffusion layer is comprised of a material selected from the group consisting of nickel, copper, steel and combinations thereof.

6. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein at least one of said anode metallic diffusion layer and said cathode metallic diffusion layer comprises a composition of loose pieces of metal that have spaces therebetween allowing substances to pass between the interstices of said metal pieces.

7. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 further comprising

a first flow field plate disposed parallel to said anode metallic diffusion layer;

a second flow field plate disposed parallel said cathode metallic diffusion layer;

each of said flow field plates having grooves formed therein to direct the flow of substances within said fuel cell most efficiently across its respective metallic diffusion layer; and

a load connected between said first flow field plate and said second flow field plate to form an electrical circuit external to said fuel to extract electrons, and thus electricity, from said fuel cell.

8. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said anode metallic diffusion layer performs as a flow field plate to conduct electrons produced in said electricity generating reactions and said load being connected at one end to said anode metallic diffusion layer to provide a path for said electrons out of said fuel cell as the electricity produced by said fuel cell.

9. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said cathode metallic diffusion layer performs as a flow field plate to reunite electrons with protons that pass through said membrane and said load being attached at one end to said cathode metallic diffusion layer to reunite said electrons with said protons and reacting with oxygen at said cathode side of said fuel cell thus producing water.

10. (Withdrawn) The direct oxidation fuel cell as defined in claim 8 wherein said anode metallic diffusion layer performing as said flow field plate includes grooves formed therein to direct the flow of fuel to said anode face of said membrane electrode assembly.

11. (Withdrawn) The direct oxidation fuel cell as defined in claim 9 wherein said cathode metallic diffusion layer performing as said flow field plate has grooves formed therein to direct the flow of said oxygen across the cathode face of said membrane electrode assembly.

12. (Withdrawn) The direct oxidation fuel cell as defined in claim 1 wherein said fuel is selected from the group consisting of methanol, ethanol, propane, butane and aqueous solutions thereof, and combinations thereof.

13. (Withdrawn) A direct oxidation fuel cell system, comprising:

(A) a direct oxidation fuel cell including an anode, a cathode, and a membrane electrolyte disposed between the anode and the cathode;

(B) a source of fuel;

(C) a source of oxygen coupled to said cathode so as to produce electricity-generating reactions including anodic disassociation of said fuel to produce carbon dioxide, protons and electrons and a cathodic combination of protons, electrons and oxygen producing water;

(D) a gas separator coupled to receive said carbon dioxide produced at said anode;

(E) an anodic metallic diffusion layer disposed generally parallel to said anode face of said membrane electrode assembly and having a plurality of openings therein to allow said associated fuel mixture to pass therethrough to said anode face of said membrane electrode assembly to a contact point on said membrane to produce said electricity generating reaction, and to allow free electrons and carbon dioxide produced in said reactions to return back away from said membrane electrode assembly, and to allow unreacted fuel to return back from said membrane electrode assembly;

(F) a cathodic metallic diffusion layer disposed generally parallel to said cathode face of said membrane electrode assembly and having

a plurality of openings therein to allow oxygen to pass therethrough to said cathode face of said membrane electrode assembly and protons, electrons and water to pass back away from said membrane electrode assembly; and

(G) a load coupled across said fuel cell providing a path for said free electrons produced in said electricity-generating reactions.

14. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein said openings in at least one of said anodic metallic diffusion layer and said cathodic metallic diffusion layer comprise a plurality of pores formed in said metallic diffusion layer.

15. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein at least one of said anode metallic diffusion layer and said cathode metallic diffusion layer comprise a porous metal that has said openings therein that allow substances to pass through said openings.

16. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein at least one of said anode metallic diffusion layer and said cathode metallic diffusion layer comprises a composition of loose pieces of metal that have spaces therebetween allowing substances to pass between the interstices of said metal pieces.

17. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 further comprising:

a first flow field plate disposed parallel to said anode metallic diffusion layer;

a second flow field plate disposed parallel said cathode metallic diffusion layer;

each of said flow field plates having grooves formed therein to direct the flow of substances within said fuel cell most efficiently across its respective metallic diffusion layer; and

a load connected between said first flow field plate and said second flow field plate to form an electrical circuit external to said fuel to extract electrons, and thus electricity, from said fuel cell.

18. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein

said anode metallic diffusion layer performs as a flow field plate to conduct electrons produced in said electricity generating reactions and said load being connected at one end to said anode metallic diffusion layer to provide a path for said electrons out of said fuel cell as the electricity produced by said fuel cell.

19. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein

said cathode metallic diffusion layer performs as a flow field plate to reunite electrons with protons that pass through said membrane and said load being attached at one end to said cathode metallic diffusion layer to reunite said electrons with said protons and reacting with oxygen at said cathode side of said fuel cell thus producing water.

20. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein

said anode metallic diffusion layer performing as said flow field plate includes grooves formed therein to direct the flow of fuel to said anode face of said membrane electrode assembly.

21. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein

said cathode metallic diffusion layer performing as said flow field plate has grooves formed therein to direct the flow of said oxygen across the cathode face of said membrane electrode assembly.

22. (Withdrawn) The direct oxidation fuel cell system as defined in claim 13 wherein

said fuel is selected from the group consisting of methanol, ethanol, propane, butane and aqueous solutions thereof, and combinations thereof.

23. (Cancelled)

24. (Previously Presented) A direct oxidation fuel cell, comprising:

(A) a membrane electrode assembly disposed within a fuel cell housing, including

(i) a protonically conductive, electronically non-conductive membrane electrolyte having an anode face and an opposing cathode face;

(ii) an anodic metallic diffusion layer disposed generally parallel to said anode face of said membrane electrode assembly and having a plurality of openings therein, said openings being of a size so as to regulate mass transport of an associated fuel substance therethrough to said anode face of said membrane electrode assembly to produce electricity generating reactions and to allow the mass transport of carbon dioxide produced in said reactions away from said membrane electrode assembly;

(iii) an anode catalyst disposed generally between said anode face and said anodic metallic diffusion layer, and a cathode catalyst disposed generally between said cathode face of the protonically conductive, electronically non-conductive membrane electrolyte, and a cathode side of said housing, whereby electricity-generating reactions occur upon introduction of said associated fuel substance including anodic disassociation of said fuel substance into carbon dioxide, protons and electrons, and a cathodic combination of protons, electrons and oxygen from an associated source of oxygen, producing water; and

(B) a load coupled across an anode and cathode of said fuel cell, providing a path for said electrons produced at the anode by said electricity-generating reactions, to the cathode.

25. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein

said openings in said anodic metallic diffusion layer comprise a plurality of pores formed in said anodic metallic diffusion layer.

26. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer comprises a porous metal that has openings therein to allow substances to pass through said openings.

27. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is at least partially comprised of at least one of titanium, chromium, stainless steel and other alloys, or combinations thereof.

28. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is at least partially comprised of a metallic material that does not substantially react with methanol, or other reactants and by products of the electricity generating reactions.

29. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein

said anodic metallic diffusion layer comprises a composition of pieces of metal bonded together that have spaces therebetween allowing substances to pass between the interstices formed by said spaces between metal pieces.

30. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is treated with a substance that renders at least a portion of the anodic metallic diffusion layer at least partially hydrophobic to control the flow of water while allowing the flow of gases.

31. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is treated with a substance that renders at

least a portion of the anodic metallic diffusion layer at least partially hydrophilic to encourage the flow of at least one of fuel and water.

32. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is treated with a substance that renders a first portion of the layer hydrophobic and a second portion of the layer hydrophilic, to allow for the flow of water and fuel and the flow of gases in proportion to the portion that is hydrophilic and hydrophobic, respectively, throughout the anodic metallic diffusion layer.

33. (Previously Presented) The direct oxidation fuel cell as defined in claim 25 wherein said pores are of more than one dimension.

34. (Previously Presented) The direct oxidation fuel cell as defined in claim 33 wherein a group of said pores formed in said anodic metallic diffusion layer are of a larger size than a remaining group of said pores, and at least some of the pores of said larger size are treated with a hydrophilic material.

35. (Previously Presented) The direct oxidation fuel cell as defined in claim 34 wherein at least some of said remaining group of pores are treated with a hydrophobic material.

36. (Previously Presented) The direct oxidation fuel cell as defined in claim 33 wherein at least some of said pores of said layer are treated with NAFION® , or a substance that renders treated pores at least partially hydrophilic.

37. (Previously Presented) The direct oxidation fuel cell as defined in claim 33 wherein at least some of said pores of said layer are treated with TEFLON®, or other hydrophobic agent to render treated pores at least partially hydrophobic.

38. (Previously Presented) The direct oxidation fuel cell as defined in claim 29 wherein said pieces of metal are bonded together by particle diffusion bonding techniques.

39. (Previously Presented) The direct oxidation fuel cell as defined in claim 38 wherein said particles are treated by at least one of a hydrophobic substance and a hydrophilic substance.

40. (Previously Presented) The direct oxidation fuel cell as defined in claim 24, wherein a first portion of said layer is treated with a hydrophobic substance, and a second portion of said layer is treated with a hydrophilic substance, to form a pattern in said metallic diffusion layer of areas of relative hydrophobicity and areas of relative hydrophilicity, to provide discrete paths through the metallic diffusion layer through which gaseous and liquid reactants and byproducts can pass.

41. (Previously Presented) The direct oxidation fuel cell as defined in claim 24, further comprising:

a flow field plate disposed generally parallel to said anodic metallic diffusion layer, said flow field plate having channels formed therein to direct the flow of substances within said fuel cell across said anodic metallic diffusion layer.

42. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein

said anodic metallic diffusion layer performs as a flow field plate and current collector to conduct electrons produced in said electricity generating reactions and said load being coupled to said anodic metallic diffusion layer to provide a path for said electrons out of said fuel cell as the electricity is produced by said fuel cell.

43. (Previously Presented) The direct oxidation fuel cell as defined in claim 42 wherein

said anodic metallic diffusion layer performing as said flow field plate and current collector includes channels formed therein to direct the flow of fuel to said anode face of said membrane electrode assembly.

44. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 further comprising

a cathodic metallic diffusion layer disposed generally parallel to said cathode face of said membrane electrode assembly and having a plurality of openings therein, said openings being sized to regulate the transport of oxygen to said cathode face of said membrane electrode assembly, and to control water in said fuel cell.

45. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein

said openings in said cathodic metallic diffusion layer comprise a plurality of pores formed in said cathodic metallic diffusion layer, said pores being sized to regulate the water released from the cathode aspect of the fuel cell.

46. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein

said cathodic metallic diffusion layer comprises a porous metal that has openings therein that allow substances to pass through said openings, said openings being sized to regulate the water that is released from the cathode aspect of the fuel cell.

47. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein

said cathodic metallic diffusion layer comprises a porous metal that has openings therein that allow removal of liquids from, and allow introduction of gases to the membrane electrode assembly.

48. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is at least in part comprised of a material selected from the group consisting of nickel, copper, titanium, chromium, steel, stainless steel, and other alloys and combinations thereof.

49. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is at least in part comprised of a material that does not substantially react with byproducts or substances, present on the cathode of the fuel cell.

50. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein

said cathodic metallic diffusion layer comprises a composition of pieces of metal bonded together that have spaces therebetween allowing substances to pass through the interstices formed by said spaces between said metal pieces, the spaces being sized to control the flow of water in said fuel cell.

51. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is treated with a substance that renders the layer at least partially hydrophobic, to allow the introduction of gases to the membrane electrode assembly.

52. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is treated with a substance that renders the layer at least partially hydrophilic, to allow the removal of liquids from the cathode face of the membrane electrode assembly.

53. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is treated with a first substance that renders a first portion of the cathodic metallic diffusion layer hydrophobic and a second sub-

stance that renders a second portion of the cathodic metallic diffusion layer hydrophilic, to balance the flow of water and the flow of gases throughout the cathodic metallic diffusion layer.

54. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 further comprising a second flow field plate that is disposed generally parallel to said cathodic metallic diffusion layer.

55. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein

said cathodic metallic diffusion layer performs as a flow field plate and current collector, and said load being coupled to said cathodic metallic diffusion layer to provide a path for electrons to travel to the cathode where it combines with oxygen at said cathode side of said fuel cell, producing water.

56. (Previously Presented) The direct oxidation fuel cell as defined in claim 55 wherein

said cathodic metallic diffusion layer performing as said flow field plate and current collector has channels formed therein to direct the flow of oxygen across the cathode face of said membrane electrode assembly.

57. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is at least in part comprised of a material having properties that improve conductivity.

58. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said anodic metallic diffusion layer is treated or coated with a material to provide improved conductivity.

59. (Previously Presented) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic diffusion layer is at least in part comprised of a material having properties that improve conductivity.

60. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein said cathodic metallic diffusion layer is treated or coated with a material to provide improved conductivity.

61. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein

said fuel substance is a liquid carbonaceous fuel substance.

62. (Previously Presented) The direct oxidation fuel cell as defined in claim 24 wherein

said fuel substance is selected from the group consisting of methanol, ethanol, propanol, butanol and aqueous solutions thereof and combinations thereof.

63. (Withdrawn) A direct oxidation fuel cell system, comprising:

(A) a direct oxidation fuel cell including an anode, a cathode, and a membrane electrode assembly including a catalyzed membrane disposed between the anode and the cathode;

(B) a catalyst in proximity to said membrane electrolyte;

(C) a source of fuel in communication with the anode;

(D) a source of oxygen in communication with said cathode so as to produce electricity-generating reactions including anodic disassociation of said fuel to produce carbon dioxide, protons and electrons and a cathodic combination of protons, electrons and oxygen producing water;

(E) an anodic metallic diffusion layer disposed generally parallel to said anode of said membrane electrode assembly and having a plurality of openings therein to allow a fuel substance to pass therethrough to said anode of said

membrane electrode assembly to produce said electricity generating reactions, and to allow electrons and carbon dioxide produced in said reactions to travel away from said membrane electrode assembly; and

(F) a load coupled across said anode and cathode of said fuel cell, providing a path for said electrons produced at the anode by said electricity-generating reactions, to the cathode.

64. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63, further comprising a liquid/gas separator coupled to separate gaseous products of the anodic reaction from any liquids present.

65. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63, wherein said openings in said anodic metallic diffusion layer comprise a plurality of pores formed in said anodic metallic diffusion layer.

66. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63 wherein said anodic metallic diffusion layer comprises a porous metal that has openings therein that allows substances to pass through said openings.

67. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63wherein said anodic metallic diffusion layer comprises a composition of loose pieces of metal bonded together that have spaces therebetween allowing substances to pass through the interstices formed by the spaces between said metal pieces.

68. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63 further comprising:

(A) a flow field plate disposed generally parallel to said anodic metallic diffusion layer;

(B) a second flow field plate disposed generally parallel to said cathode face of said membrane electrode assembly, and each of said first and second flow field plates having channels formed therein to direct the flow of substances within said fuel cell across its respective metallic diffusion layers; and

(C) a load coupled between said first flow field plate and said second flow field plate to form and electrical circuit through which electrical current generated by the fuel cell system may flow.

69. (Withdrawn) The direct oxidation fuel cell system as defined in claim 63 wherein said anodic metallic diffusion layer performs as a flow field plate and current collector to conduct electrons produced in said electricity generating reactions and said load being coupled c to said anodic metallic diffusion layer to provide a path for said electrons away from said anode.

70. (Withdrawn) The direct oxidation fuel cell system as defined in claim 69 wherein said anodic metallic diffusion layer performing as said flow field plate and current collector includes channels formed therein to direct the flow of fuel to said anode face of said membrane electrode assembly.

71. (Withdrawn) A direct oxidation fuel cell, comprising:

(A) a membrane electrode assembly disposed within a fuel cell housing, including:

(i) a protonically conductive, electronically non-conductive membrane electrolyte having an anode face and an opposing cathode face;

(ii) a cathodic metallic diffusion layer disposed generally parallel to said cathode face of said membrane electrode assembly and having a plurality of openings therein to allow oxygen to pass therethrough to said cathode face of said membrane electrode assembly and protons, electrons and water to travel away from said membrane electrode assembly;

(iii) an anode catalyst disposed generally between said anode face and an anode side of said housing, and a cathode catalyst disposed generally between said cathode face and said cathodic metallic diffusion layer, whereby electricity-generating reactions occur upon introduction of said associated fuel substance including anodic disassociation of said fuel substance into carbon dioxide, protons and electrons, and a cathodic combination of protons, electrons and oxygen from an associated source of oxygen, producing water; and

(B) a load coupled across the anode and cathode of said fuel cell, providing a path for said electrons produced at the anode by said electricity-generating reactions, to the cathode.

72. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said openings in said cathodic diffusion layer comprise a plurality of pores formed in said cathodic metallic diffusion layer.

73. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein

said cathodic metallic diffusion layer comprises a porous metal that has openings therein that allows substances to pass through said openings.

74. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said cathodic metallic diffusion layer is at least in part comprised of a material selected from the group consisting of nickel, copper, titanium, chromium steel, stainless steel, and other suitable alloys and combinations thereof.

75. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said cathodic metallic diffusion layer is at least in part comprised of a material that does not substantially react with byproducts or substances, present on the cathode of the fuel cell.

76. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said cathodic metallic diffusion layer comprises a composition of loose pieces of metal bonded together that have spaces therebetween allowing substances to pass through the interstices formed by the spaces between said metal pieces.

77. (Withdrawn) The direct oxidation fuel cell as defined in claim 71wherein said cathodic metallic diffusion layer is treated with a substance that renders the layer at least partially hydrophobic.

78. (Withdrawn) The direct oxidation fuel cell as defined in claim 71wherein said cathodic metallic diffusion layer is treated with a substance that renders the layer at least partially hydrophilic.

79. (Withdrawn) The direct oxidation fuel cell as defined in claim 71wherein said cathodic metallic diffusion layer is treated with a substance that renders a first portion of the layer hydrophobic and a second portion of the layer hydrophilic.

80. (Withdrawn) The direct oxidation fuel cell as defined in claim 72wherein said pores are of more than one dimension.

81. (Withdrawn) The direct oxidation fuel cell as defined in claim 72wherein a group of said pored formed in said cathodic metallic diffusion layer are of a larger size than a remaining group of said pores, and at least some of the pores of said larger size are treated with a hydrophilic material.

82. (Withdrawn) The direct oxidation fuel cell as defined in claim 81wherein at least some of said remaining group of pores are treated with a hydrophobic material.

83. (Withdrawn) The direct oxidation fuel cell as defined in claim 72wherein at least some of said pores of said layer are treated with Nafion, or a substance that renders treated pores at least partially hydrophilic.

84. (Withdrawn) The direct oxidation fuel cell as defined in claim 72wherein at least some of said pores of said layer are treated with Teflon, or other hydrophobic agent to render treated pores at least partially hydrophobic.

85. (Withdrawn) The direct oxidation fuel cell as defined in claim 71wherein said loose pieces of metal are bonded together by particle diffusion bonding techniques.

86. (Withdrawn) The direct oxidation fuel cell as defined in claim 71wherein said particles are treated by at least one of a hydrophobic substance and a hydrophilic substance.

87. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein a first portion of said layer is treated with a hydrophobic substance, and a second portion of said layer is treated with a hydrophilic substance, to form a pattern in said diffusion layer of areas of relative hydrophobicity and areas of relative hydrophilicity, to provide discrete paths through the metallic diffusion layer through which gaseous and liquid reactants and byproducts can pass.

88. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, further comprising:

a flow field plate disposed generally parallel to said cathodic metallic diffusion layer, said flow field plates having channels formed therein to direct the flow of substances within said fuel cell across the cathodic metallic diffusion layer.

89. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein

said cathodic metallic diffusion layer performs as a flow field plate and current collector to reunite said electrons with protons that pass through said membrane and said load being coupled to said cathodic metallic diffusion layer to reunite said electrons with said protons and react with oxygen at said cathode side of said fuel cell thus producing water.

90. (Withdrawn) The direct oxidation fuel cell as defined in claim 89, wherein said cathodic metallic diffusion layer performing as said flow field plate and current collector has channels formed therein to direct the flow of said oxygen across the cathode face of said membrane electrode assembly.

91. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said fuel substance is a liquid carbonaceous fuel substance.

92. (Withdrawn) The direct oxidation fuel cell as defined in claim 71, wherein said fuel substance is selected from the group consisting of methanol, ethanol, propanol, butanol and aqueous solutions thereof and combinations thereof.

93. (Withdrawn) A direct oxidation fuel cell system, comprising:

(A) a direct oxidation fuel cell including an anode, a cathode, and a membrane electrode assembly disposed between the anode and the cathode;

(B) a catalyst in proximity to said membrane electrolyte;

(C) a source of fuel in communication with the anode;

(D) a source of oxygen in communication with said cathode so as to produce electricity-generating reactions including anodic disassociation of said fuel to produce carbon dioxide, protons and electrons and a cathodic combination of protons, electrons and oxygen producing water;

(E) a cathodic metallic diffusion layer disposed generally parallel to said cathode face of said membrane electrode assembly and having a plurality of openings therein to allow oxygen to pass therethrough to said cathode face of said membrane electrode assembly and protons, electrons and water to travel away from said membrane electrode assembly; and

(F) a load coupled across the anode and the cathode of said fuel cell, providing a path for said electrons produced at the anode by said electricity-generating reactions, to the cathode.

94. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, further comprising:

a liquid/gas separator coupled to separate gaseous products of the anodic reaction from any liquids present.

95. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein

said openings in said cathodic metallic diffusion layer comprise a plurality of pores formed in said cathode metallic diffusion layer.

96. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein said cathode metallic diffusion layer comprises a porous metal that has openings therein that allow substances to pass through said opening.

97. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein

said cathode metallic diffusion layer comprises a composition of loose pieces of metal bonded together that have spaces therebetween allowing substances to pass through the interstices formed by said spaces between said metal pieces.

98. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, further comprising:

(A) a first flow field plate disposed generally parallel to said anode face of said membrane electrode assembly;

(B) a second flow field plate disposed generally parallel to said cathode metallic diffusion layer, each of said flow field plates having channels formed therein to direct the flow of substances within said fuel cell; and

(C) a load coupled between said first flow field plate and said second flow field plate to form an electrical circuit external to said fuel to extract electrons, and thus electricity from said fuel cell.

99. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein said cathode metallic diffusion layer performs as a flow field plate and current collector to reunite electrons with protons that pass through said membrane and said load being coupled to said cathode metallic diffusion layer to reunite said electrons with said protons and react with oxygen.

100. (Withdrawn) The direct oxidation fuel cell system as defined in claim 99, wherein said cathodic metallic diffusion layer performing as said flow field plate and current collector has channels formed therein to direct the flow of oxygen across the cathode face of said membrane electrode assembly.

101. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein

said fuel is a liquid carbonaceous fuel.

102. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93, wherein

said fuel is selected from the group consisting of methanol, ethanol, propanol, butanol and aqueous solutions thereof, and combinations thereof.

103. (Withdrawn) The direct oxidation fuel cell system as defined in claim 93wherein said cathodic metallic diffusion layer has openings therein that allow removal of liquids from, and allow the introduction of gases to the membrane electrode assembly.

104. (Withdrawn) A direct oxidation fuel cell system comprising:

(A) a direct oxidation fuel cell means including a membrane electrode assembly having an anode, a cathode and a protonically conductive, electronically non-conductive membrane electrolyte disposed between the anode and the cathode;

(B) means for providing a fuel substance to said fuel cell;

(C) means for providing oxygen to said cathode of said membrane electrode assembly so as to produce electricity-generating reactions including cathodic combination of protons, electrons and oxygen producing water; and

(D) means for distributing said fuel substance generally evenly to said anode of said membrane electrode assembly so as to produce electricity-generating reactions including anodic disassociation of said fuel substance to produce carbon dioxide, protons and electrons.

105. (Withdrawn) The direct oxidation fuel cell system as defined in claim 104, further comprising a means for distributing said oxygen generally evenly to said cathode and said means for distributing said oxygen.

106. (Withdrawn) The direct oxidation fuel cell system as defined in claim 104, further comprising said means for distributing said fuel substance being of a substantially metallic composition.

107. (Withdrawn) The direct oxidation fuel cell system as defined in claim 104, further comprising a means for allowing gaseous products of the anodic reaction to be removed from the membrane electrode assembly.

108. (Withdrawn) The direct oxidation fuel cell system as defined in claim 104, further comprising a means for allowing fluid byproducts of the cathodic reaction to be removed from the membrane electrode assembly.

109. (Withdrawn) The direct oxidation fuel cell system as defined in claim 104, wherein said means for distributing said oxygen being substantially comprised of a metallic composition.

110. (Withdrawn) A means for generating electricity comprising:

(A) a direct oxidation fuel cell means including a membrane electrode assembly having an anode, a cathode, and a protonically conductive electronically non-conductive membrane electrolyte disposed between said anode and said cathode;

(B) means for providing oxygen coupled to said cathode so as to produce electricity-generating reactions including anodic disassociation of a fuel sub-

stance to produce carbon dioxide, protons and electrons and a cathodic combination of protons, electrons and oxygen producing water;

(C) means for providing said fuel substance to said fuel cell

(D) means for distributing oxygen generally evenly to said cathode; and

(E) means for coupling the anode to the cathode.

111. (Withdrawn) The direct oxidation fuel cell as defined in claim 24 further comprising:

an additional layer, disposed between said anodic metallic diffusion layer and said anode catalyst, of at least one of the following:

(i) carbon paper; and

(ii) carbon cloth.

112. (Withdrawn) The direct oxidation fuel cell as defined in claim 44 further comprising:

an additional layer, disposed between said cathodic metallic diffusion layer and said cathode catalyst, of at least one of the following:

(i) carbon paper; and

(ii) carbon cloth.

113. (Withdrawn) The direct oxidation fuel cell as defined in claim 44 wherein said cathodic metallic component is substantially hydrophilic.

114. (New) A direct oxidation fuel cell, comprising:

a) a membrane electrode assembly including a protonically conductive, electronically non-conductive membrane electrolyte having an anode aspect and an opposing cathode aspect;

b) an anodic metallic diffusion layer comprised of a metallic plate having alternating rows of pores therein, a first row of pores including pores of a first diameter, and a second row of pores being of a smaller diameter, and alternating said first and second diameter pores throughout the metal plate, such that pore distributions are selected for facilitating the anode and cathode reactions by creating discrete and continuous mass transport paths through the metallic component for each of the liquid reactants and byproducts, and the gaseous reactants and byproducts selectively;

c) a load coupled across the anode and cathode of said fuel cell, providing a path for electrons produced at the anode by electricity generating reactions, to the cathode.

115. (New) A direct oxidation fuel cell, comprising:

a) a membrane electrode assembly including a protonically conductive, electronically non-conductive membrane electrolyte having an anode aspect and an opposing cathode aspect;

b) a metallic layer component fabricated of microscopic particles that have been heated and bonded together such that openings are created wherein the size of said openings is determined by the diameter of the particles, and the diameter is chosen to allow various reactants to pass through as desired.

116. (New) The direct oxidation fuel cell as defined in claim 114 wherein said metallic layer component is treated at least in part with either at least one of a hydrophobic treatment or a hydrophilic treatment creating a pattern of hydrophobic areas and/or hydrophilic areas in a desired configuration to facilitate transport of reactants and products to and/or from the protonically conductive membrane.